

Customer No.: 31561
Application No.: 10/605,163
Docket No.: 10230-US-PA

REMARKS

Present Status of the Application

The drawings were objected to under 37 CFR 1.83 (a). All pending claims 1-8 and 18-26 were rejected. Specifically, claims 4, 24 and 25 were rejected under 35 U.S.C. 112, second paragraph. Claims 1, 2, 4-8, 18-23, 25 and 26 were rejected under 35 U.S.C. 103(a) as being unpatentable over Degani et al. (US 5,646,828) in view of Nakatani et al. (Japan Patent No. 57-32676). Claim 3 was rejected under 35 U.S.C. 103(a) as being unpatentable over Degani et al. in view of Nakatani et al. and Osedo (JP 3-187227A).

In response thereto, Applicant has amended FIG. 2 to clearly show the feature of claims 4 and 25. Applicant has also amended claims 1, 18 and 26 by adding the feature of claims 3 and 24, and has canceled claims 3 and 24. After entry the forgoing amendment, claims 1, 2, 4-8, 18-23, 25 and 26 remain pending, and continued examination of these claims is respectfully requested.

Discussion of Objection under 37 CFR 1.83 (a)

Please refer to the Replacement Sheet, FIG. 2 has been amended to clearly show the gold (272) plated on the heat spreader 270, which is the feature of claims 4 and 25. The gold 272 is added on both of the upper and lower surfaces of the heat spreader 270 in FIG. 2, according to the following words in the original paragraph [0028] of the specification:

"..... Moreover, the heat spreader 270 can be plated with gold to improve the adhesion

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between the heat spreader 270 and the chip 230, and to improve the adhesion between the heat spreader 270 and the motherboard 300 (FIG. 3). ..."

To be capable of improving the adhesion between the heat spreader 270 and the chip 230 as well as that between the heat spreader 270 and the motherboard 300, the gold 272 is surely plated on both surfaces of the heat spreader 270 facing 230 and 300 (FIG. 3), respectively.

Hence, Applicant respectfully requests withdrawal of the objection under 37 CFR 1.83 (a).

Discussion of Amendments to Claims

Only independent claims 1, 18 and 26 are amended currently, while they are amended by incorporating the feature (dummy chip) of the canceled claims 3 and 24. Accordingly, the amendments constitute no new matter.

Discussion of Rejections under 35 U.S.C. 112

Claims 4, 24 and 25 were rejected under 35 U.S.C. 112, second paragraph. Please note that claim 24 has been canceled, and *the feature thereof is added into independent claim 18*.

Because FIG. 2 has been amended to clearly show the feature of claims 4 and 25, as mentioned above, claims 4 and 25 can be supported by the drawings. Therefore, Applicant respectfully requests withdrawal of the corresponding rejections under 35 U.S.C. 112.

As for canceled claim 24, *the heat spreader* being without signal transmission functions and comprising silicon *is actually a dummy chip* as Examiner has speculated, while the dummy

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chip is described in paragraph [0028]. Therefore, the feature of canceled claim 24 is amended as *the heat spreader comprising a dummy chip* and is incorporated into independent claim 18. Accordingly, Applicant respectfully requests withdrawal of the corresponding rejection under 35 U.S.C. 112.

Discussion of Rejections under 35 U.S.C. 103(a)

Claims 1, 2, 4-8, 18-23, 25 and 26 were rejected under 35 U.S.C. 103(a) as being unpatentable over Degani et al. in view of Nakatani et al., while claim 3 was rejected under 35 U.S.C. 103(a) further in view of Osedo. Please note that claims 3 and 24, which feature *the heating spreader comprising a dummy chip*, have been canceled, and the feature thereof is added into independent claims 1, 18 and 26. Since claim 3 was rejected by the combination of Degani et al., Nakatani et al. and Osedo, the patentability of claims 1, 2, 4-8, 18-23, 25 and 26 over the combination of all the three documents is discussed below.

Please refer to the amendments, the features of claims 1, 18 and 26 include at least: 1) the heat spreader of the MCM package being bonded to the active surface of the first chip, and 2) the heat spreader comprising a dummy chip. Applicant respectfully submits that the two features both are non-obvious over the combination of Degani et al., Nakatani et al. and Osedo for at least the reasons set forth.

For Feature 1

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According to the rejection reasons for claims 1, 18 and 26 in the Office Action, Examiner considered the members 19 and 73 in Degani et al. as heat spreaders. However, Applicant respectfully submits that *both of the members 19 and 73 are not heat spreaders* for the reasons below.

For the member 73 in Degani et al, according to col. 7, lines 36-38, the members 73 in FIGs. 7-8 are actually bond fingers electrically connected to the contacts 74 on the PWB 71. As known in the art and indicated by FIGs. 7-8, the bond fingers 74 are very thin and can impossibly serve as a heat spreader *that is generally recognized to have a much larger surface area*.

As for the member 19 in Degani et al., according to the Detailed Description (col. 4, lines 46-49), the structure illustrated in each of the figures 1-8 is a MCM package that includes a silicon substrate 18 and chips 19 and 20. Since MCM is known in the art as a module including *at least two chips* having electronic functions for higher performance and there are *only two chips 19 and 20* depicted in the figures, both of the chips 19 and 20 in Degani et al. should be real chips having electronic functions. Therefore, the chip 19 should be a heat source, *which is exactly contrary to a heat spreader*. In fact, the real heat spreaders in Degani et al. are the structural member 30 in FIG. 1, 39 in FIGs. 2-3, 47 in FIGs. 4-5, 65 in FIG. 6, and the cup-like cover 75 in FIGs. 7-8, each of which is disposed either *facing the back surface* of the silicon substrate 18 or *facing the back surfaces* of the real chips 19 and 20.

Since the members 19 and 73 are not heat spreaders and the chip 19 is even a heat source contrary to a heat spreader, one skilled in the art is not motivated to replace the member 19 or 73.

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especially the real chip 19 as a heat source contrary to a heat spreader, with the heat spreaders 5 in Nakatani et al., which *faces the active surface* of the wafer 1, to obtain the feature 1. In fact, Degani et al. and Nakatani et al. are difficult to combine at least in the aspects concerning the heat spreader, because they are quite different in the relative position between the heat spreader and the substrate/chips (facing active surface in Nakatani vs. facing back surface(s) in Degani).

In addition, Osedo does not mention or imply the use of any heat spreader. According to the English Abstract of Osedo: "*Metal chips 5 whose dimensions are made to be uniform beforehand are bonded to the surfaces of the electrodes 3 of a semiconductor device to form bumps.....*" as well as to FIGs. 1 and 4 of Osedo where the chip 5 is shown to be rounded to form a solder bump 4, *the chip 5 is actually a solder bump*, but is absolutely not a heat spreader as described and illustrated in the specification and drawings of this invention. As known in the art, the diameters of solder bumps are generally *smaller than 1mm*, so that the solder bumps can *impossibly* be used as a heat spreader. The solder bumps can *merely serve as one of the heat conduction paths* between the chip and the heat spreader as in this invention, while a real heat spreader like a dummy chip has a much larger surface to effectively dissipate the heat.

Since Osedo mentions nothing about a heat spreader and the chip 5 in Osedo is actually a solder bump that is *impossibly* a heat spreader, the feature 1 is still non-obvious over the prior art even though Osedo is taken into account together with Degani et al. and Nakatani et al.

For Feature 2

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The feature of claims 1, 18 and 26 that the heat spreader comprises a dummy chip either cannot be obtained by combining Degani et al., Nakatani et al. and Osedo, because *none of them teach or suggest a heat spreader comprising a dummy chip*. It is quite obvious that the heat spreader 30 in FIG. 1, 39 in FIGs. 2-3, 47 in FIGs. 4-5, 65 in FIG. 6 or the cup-like cover 75 as a heat spreader in FIGs. 7-8 of Degani et al., or the heat spreader 5 of Nakatani et al., is not a dummy chip. In addition, as mentioned above, the chip 5 in Osedo is actually a solder bump, *which is impossible a heat spreader or a dummy chip, as known in the art*.

In summary, the above features 1 and 2 both are non-obvious over the combination of Degani et al., Nakatani et al. and Osedo, while Degani et al. and Nakatani et al. that relate more with this invention than Osedo are even difficult to combine.

For at least the above reasons, Applicant respectfully submits that independent claims 1, 18 and 26 patently define over the prior art.

For at least the same reasons mentioned above, Applicant respectfully submits that claims 2, 4-8, 19-23 and 25 dependent from claims 1 and 18 also patently define over the prior art.

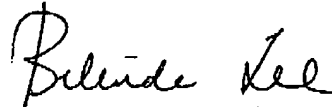
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CONCLUSION

For at least the foregoing reasons, it is believed that the pending claims 1, 2, 4-8, 18-23, 25 and 26 are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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Respectfully submitted



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In the Drawings:

Please replace the original FIG. 2 with the amended FIG. 2 in the Replacement Sheet,
wherein the amendment is the addition of the members 272.

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